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COMPLETION REPORT

Crooked Lane Well of the
Philadelphia Suburban Water Company

In January 1965, a test hole was drilled to 500 feet by the air-percussion method at the intersection of Crooked Lane and the Pennsylvania Turnpike, Upper Merion Township. A 24-hour pumping test in early February 1965 indicated that the test well had a specific capacity on the order of 8 gallons per minute per foot of drawdown at a rate of 160 gpm. A 12-inch production well with 14-inch casing to 204 feet and with a total depth of 505 feet was subsequently constructed about 5 feet from the test-hole site.

Geology and Hydrology

The Crooked Lane well is located in an area surrounded by many limestone and dolomite quarries, both active and abandoned. Perhaps the most significant of these is the active quarry operated by the Bethlehem Steel Company near Bridgeport. Carbonate rocks have been mined from this quarry for many years which has created a pit about 400 feet deep. The extensive dewatering operation necessary for quarrying procedures has resulted in pumping at a rate of about 8,000 gpm. The cone of depression produced by this pumping operation is extensive, causing a static water level of about 200 feet at the Crooked Lane well.

During both the test drilling and production-well drilling, numerous openings were encountered from the top of bedrock at about 30 feet to about 204 feet. These openings were cased off and cemented. Below the casing, a major water-bearing opening occurs at 315 feet. It is believed that this zone contributes a large percentage of the yield from this well.

In the immediate area of the well, the land surface appears to be stable. However, the bottom of the creek which carries water pumped from the Bethlehem Steel Company quarry collapsed twice within 1,500 feet of Crooked Lane during development of the well. The opening received the entire effluent of the creek. After the second collapse, the water pumped from the well became noticeably dirtier. It is believed that the affected segment of the creek bed has since been stabilized. There is a record of creek loss at other sites in past years.

Pumping Test

A pumping test was started on the Crooked Lane well at 913 gpm on January 4, 1966. It was evident, after pumping at that rate for 24 hours, that the pumping water level would probably reach the top of the largest water-bearing opening after a week of continuous pumping. Moreover, the turbidity and color of the water present at the outset of the test were still noticeable after 24 hours. The rate was, therefore, reduced to 812 gpm and maintained at that rate until January 10, 1966. An extrapolation of the drawdown trend at 812 gpm indicated that, without recharge, the pumping water level would have reached the largest water-bearing opening after about a year of continuous pumping. On January 10, there was still a slight amount of turbidity in the water which was eliminated after reducing the rate to 708 gpm. An estimation of the drawdown trend at this rate indicates that the pumping water level would remain well above the opening even after two years without recharge. The pumping rate was further reduced to 609 gpm on January 17, 1966 and the test was terminated on January 18, 1966.

Conclusions and Recommendations

Under the present hydrologic conditions, the Crooked Lane well is capable of yielding 700-750 gpm, with a pumping water level that should not exceed the depth of the major water-bearing opening. Since it is believed that most of the yield is obtained from this opening, the maximum depth of pump setting should be 310 feet.

It is expected that the Bethlehem Steel Company quarry will be shut down in the near future and this will cause the regional water level to recover, imposing a new hydrologic condition on the area. Caverns and fractures presently above the water table will be saturated once again which might lead to new well-development problems and a change in the hydraulic characteristics of the well. The extent of such new conditions cannot be determined at the present time but it is expected that the capacity of the well will be materially increased.

The problem of turbidity and color in the water, evident at higher rates during the test, appears to have been eliminated when the well is pumped at 700 gpm or less. However, there has been evidence of some kind of waste contamination, indicated by above-normal chlorides, nitrates and bacteria concentrations. This condition was apparent during pumping of the test well and also during pumping of the production well.

The yield potential of this well has been calculated to be about 700-750 gpm for conditions as they were during the test, but the capacity of the well will undoubtedly be greater as soon as the nearby deep quarry is abandoned. In our viewpoint, a yield of 1,000 gpm or more can probably be obtained after the quarry is

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allowed to fill to the planned elevation of 75 feet below mean sea level. In view of this possibility, it would seem prudent to apply for a rate of withdrawal for this well in excess of the tested rate, if such a request can be justified. Based only on the estimated increase in static level at the well when the quarry is abandoned, a figure of 1,000 gpm seems entirely possible. We cannot, of course, anticipate what turbidity problems may accompany such a rise in water level.

LEGGETTE, BRASHEARS & GRAHAM

Jack B. Graham

Jack B. Graham

March 1966

Enclosures

1. Progress Summary (Record of construction, development and testing).
2. Well log.
3. Construction diagram.
4. Pumping test curves (time-drawdown relationships derived from pumping test).
5. Hydrograph of water levels during test period.

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	Thickness of Strata	Depth
Top soil	2	2
Clay, silt, some gravel & rock fragments	10	12
Limestone boulders, cream-colored, with much yellowish tan weathered; much silt, clay & fine sand, yellowish tan; much quartz.	19	31
Limestone, fresh, cream-colored, very little gray, with much weathered, yellowish-tan; much quartz	14	45
Limestone, fresh, cream-colored, some gray, with some weathered, tan streaks of mud-filled crevices	20	65
Limestone, fresh, cream-colored, with much iron-stained, tan. Streaks of mud-filled crevices.	11	76
Opening, (lost circulation).		76
Limestone, with crevices.	3	79
Limestone, hard.	11	90
Opening, (lost circulation).		90
Limestone, hard.	3	93
Small opening		93
Limestone, hard.	2	95
Inclined opening.	1	96
Limestone, hard.	3	99
Limestone, hard, crevices at 103'-		
(Continued)		

Owner: Philadelphia Suburban Water Co.

Location: Near Bridgeport, Pa.

Well No.: Crooked Lane

Date Completed: September 1955

Drilling Company: Layne-New York Co. Inc.

Drilling Method: Standard rotary

Casing Driven: Ditch

Drilling Observations By: G. Sidney Fox

Reference Point: Land surface

Elevation of R.P.: 120'± asl

Casing: 18-inch; 0-65'
14-inch; 0-204'

Screen: Type: None

Diam.: --- Slot No.: ---

Setting: Open hole 204'-505'

Pumping Test: Date: January 4-18, 1956

Duration: 14 days, 3 hours

Static Water Level: 206.8' from land surface

Pumping Water Level: 287.6' from land surface

Yield: 913-812-708-609 gpm*

Remarks:
NOTE: No samples 0-15', 75'-203', & 315'-505'. The log for these intervals is based on the driller's interpretation of the material penetrated.

* Pumped at 913 gpm for 1 day.
Pumped at 812 gpm for 5 days, 4 hours.
Pumped at 708 gpm for 6 days, 23 hours.
Pumped at 609 gpm for 1 day.

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OWELL LOG

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New York

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Philadelphia Suburban Water Co.

Owner

Location

Well No. Crooked Lane (continued

Date Completed

Drilling Company

Drilling Method

Sampling Method

Samples Examined By

Reference Point

Elevation of R. P.

Casing

Screen Type

Make Size No.

Setting

Pumping Test Date

Duration

Static Water Level

Pumping Water Level

Yield

Remarks

Description	Thickness of Beds or Layers	Depth Below Surface
104', 105'-107', 109'-111', & 114'-120'.	21	120
Limestone, Hard, creviced at 122'-123'.	10	130
Limestone, hard	2	132
Opening	1	133
Limestone, hard	5	138
Opening	0.5	138.5
Limestone, hard	0.5	139
Opening	1.3	140.3
Limestone, very hard	11.7	152
Inclined opening	1	153
Limestone, very hard	3.5	156.5
Inclined opening	1	157.5
Limestone, very hard	15.5	173
Opening	0.5	173.5
Limestone, very hard	29.5	203
Opening, (lost circulation).		203
Limestone, fresh, cream-colored, trace of gray, very little weathered, some tan, iron stained.	6	209
Opening	0.3	209.3
Limestone, fresh, cream-colored, trace of gray, trace weathered, some tan, iron stained	5.7	215
Opening	0.2	215.2
Limestone, fresh, cream-colored,		

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DESCRIPTION	THICKNESS IN FEET	DEPTH IN FEET
trace of gray, trace weathered,		
some tan, iron stained.	4.8	220
Limestone, fresh, cream-colored	5	225
Limestone, fresh, cream-colored,		
trace of gray, little weathered,		
brown, little tan, iron stained.	5	230
Limestone, fresh, cream-colored	15	245
Limestone, fresh, cream-colored,		
some tan, iron stained.	10	255
Limestone, fresh, cream-colored,		
trace tan, iron stained.	15	270
Limestone, fresh, cream-colored &		
gray, little tan, iron stained.	25	295
Limestone, fresh, cream-colored,		
trace of gray, trace tan, iron		
stained.	5	300
Limestone, white, little gray, trace		
of tan, iron stained.	5	305
Limestone, cream-colored, little		
gray, little tan, iron stained.	5	310
Limestone, cream-colored, trace of		
gray, trace of tan, iron stained.	5	315
Opening, (lost circulation).	1	316
Limestone, hard.	57	373
Limestone, soft.	3	376
Limestone, hard.	19	395
Limestone, soft, with openings	7	402

OWNER: Philadelphia Suburban Water Co.
LOCATION:
WELL NO. Crooked Lane (continued)
DATE COMPLETED:
DRILLING COMPANY:
DRILLING METHOD:
SAMPLING METHOD:
SAMPLES EXAMINED BY:
REFERENCE POINT:
ELEVATION OF R. P.:
CASING:
SCREEN TYPE:
SLOT:
PLANT NO.
SETTING:
PUMPING TEST DATE:
DURATION:
STATIC WATER LEVEL:
PUMPING WATER LEVEL:
YIELD:
REMARKS:

WELL LOG

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DESCRIPTION	THICKNESS OF LAYER	DEPTH TO BASE
Limestone, hard	4	406
Limestone, hard, with soft streaks.	23	429
Limestone, soft	15	444
Limestone, hard	4	448
Opening	0.3	448.3
Limestone, hard	3.7	452
Openings	1	453
Limestone, hard	4.5	457.5
Inclined opening.	1.5	459
Limestone, hard	16	475
Limestone, hard, with soft streaks.	30	505

OWNER: Philadelphia Suburban Water Co.
LOCATION:
WELL NO.: Crooked Lane (continued)
DATE COMPLETED:
DRILLING CONTRACTOR:
DRILLING METHOD:
SAMPLING METHOD:
SAMPLES EXAMINED BY:
REFERENCE POINT:
ELEVATION OF R.P.:
CASING:
SCREEN TYPE:
DIAM.: SLOT NO.:
SETTING:
PUMPING TEST DATE:
DURATION:
STATIC WATER LEVEL:
PUMPING WATER LEVEL:
YIELD:
REMARKS:

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